only at a distance greater than that at which the vapours can act, no corresponding effect is produced in the image, which gradually weakens up to its borders by insensible gradations until it disappears altogether.

Practically in spite of the softness of the details and the outlines, the impressions produced by vapour are far from consisting of simple shadows; if the object is in strong relief, the image is energetic and well marked; it appears simply as if the object were seen through transparent gauze, or as if it had half emerged from a fog.

Negative images have also been obtained by acting with ammoniacal vapours upon cloths impregnated with a mixture of powdered aloes and olive oil; it is known that aloes contains a principle which turns brown and is oxidised under the influence of alkalies in moist air. A plaster hand covered with a suède glove which has been moistened with a solution of ammonium carbonate acts similarly. There is obtained in this way a sort of print of the hand, a negative softened at the edges and wanting in proportion in so far that the points where the hand is too far from the cloth are too faint, the points of contact of the hand and cloth, on the other hand, being too strongly marked. The fermentation of urea, easily brought about by the addition of a little urine, leads to the formation of ammonium carbonate and thus causes the browning of the aloes. The fermentation of a febrile sweat, rich in urea, leads to the same result, as is already well known.

The extension of Dr. Russell's researches on the photographic activity of certain bodies in the dark, contained in the above paper communicated to the Paris Academy by M. Vignon, has given rise to a most curious discussion.

There is a so-called "Holy Shroud" at Turin in which tradition states the body of Christ was wrapped after the Crucifixion. An article in the *Times* thus refers to it and its connection with M. Vignon's work:—

"It is said to have been brought from the East in the fourteenth century, and in the following century it passed into the hands of the House of Savoy, and was deposited at Chambéry. Finally, it was transferred in 1578 to its present resting-place by Duke Emmanuel Philibert, who wished to spare Carlo Borromeo, the sainted Archbishop of Milan, the fatigue of a pilgrimage to its distant Savoyard shrine. The Shroud bears upon it, traced in hues of brown, what is alleged to be a double impression of the figure of Our Lord, the outlines both of the face and back of which have reproduced themselves with wonderfully distinct exactness. So seldom, however, is it exposed to view that this remarkable characteristic had almost been forgotten when, in May, 1898, some photographs specially taken of it by Signor Secondo Pia, of Turin, with the consent of its possessor, the King of Italy, once more drew attention to this strangely living likeness. Eighteen months ago these photographs came under the notice of M. Vignon, who, recognising their exceptional importance, at once began that inquiry of which the results were made public in a paper communicated to the Académie des Sciences."

In Paris, therefore, it has been generally accepted that a demonstration has been given by science of the authenticity, not only of the so-called shroud, but of all the historical events connected with it, and a much closer rapprochement between science and theology is predicted for the future.

Here, however, difficulties have been raised. Father Thurston, a learned Jesuit, writes to the *Times* as follows:—

"Before we can profitably discuss the value of Dr. Vignon's scientific explanation of the marks on the 'Holy Shroud' a serious difficulty of quite another order has to be cleared up. The Abbé Ulysse Chevalier claims to have proved to demonstration that the linen winding-sheet exhibited at Turin is a spurious relic manufactured in the fourteenth century, and, as the writer believes, with fraudulent intent. M. l'Abbé Chevalier is a scholar of distinction, and of his perfect loyalty to the Catholic Church there can be no possible question. Moreover, his essay ("Étude Critique sur l'Origine du S. Suaire," Paris, Picard, 1900) has been warmly welcomed by the more critical journals devoted to hagiography. In the Bollandist periodical, the *Analecta Bollandiana*, for instance, its Jesuit editors state (vol. xix., 1900, p. 350) that the Abbé Chevalier's discussion of the subject is final, and that 'il ne reste plus qu'à proclamer "à haute et intelligible voix," comme le voulait le Pape Clément VII.: "Hæc figura . . . non est verum sudarium Domini Nostri Jesu Christi."'

"They go on to state that the story of the 'image of the shroud' given by Geoffroy de Lirey to the college founded by him in 1353 is not lost in the mist of ages, and does not happen to present any of those obscurities by which the historian who wishes to impart his own laboriously-acquired conviction to others must at times find himself baffled. We have, for instance, the document addressed to the Pope by Bishop Peter d'Arcis, in which he denounces the fraudulent dealing of the Chapter of Lirey, who for motives of avarice pretended that miracles were worked by this shroud, whereas his predecessor in the see of Troyes had officially investigated the matter and proved it to be a forgery. 'Et probatum fuit eciam per artificem qui illum (pannum) depinxerat, ipsum humano opere factum, non miraculose confectum vel concessum.'"

There is also another difficulty. It is stated that there is at least one other Holy Shroud in another holy place.

NOTES.

THE governing body of the Jenner Institute of Preventive Medicine has appointed Major Ronald Ross, F.R.S., whose name is well known in connection with his researches on malaria, to be head of a new department in the Institute at Chelsea.

WE learn from the *British Medical Journal* that the Legislature of New Jersey has passed a Bill which sets aside 10,000 dollars for the support of an experiment station where scientific investigations are to be made into the habits and breeding-places of mosquitoes and their relations to public health.

WE regret to see the announcement of the death, at the age of sixty, of M. Henri Filhol, professor of palæontology at the Jardin des Plantes, Paris; and also of Prof. I. L. Fuchs, professor of mathematics in the University of Berlin.

THE council of the Royal Institute of Public Health has conferred the Harben Gold Medal for the year 1902 upon Prof. W. R. Smith, late medical officer of the School Board for London, in recognition of his eminent services to the public health.

THE Washington correspondent of the *Times* reports that Lord Kelvin and Mr. Westinghouse both gave evidence on April 24 before a committee of the House of Representatives appointed to consider the present system of coinage and weights and measures. Lord Kelvin advocated the passing of a Bill to substitute the metric system for the standard now employed in the United States. Mr. Long, Secretary of the Navy, expressed the hope that England would take the lead in this change, but said that if England did not the United States should, and England would then follow. Mr. Westinghouse supported the Bill, but declared that it would take ten years for the people to learn to use the metric system.

IN connection with the second International Congress of Medical Electricity and Radiography, to be held at Bern on September 1–6, there will be an exhibition of apparatus relating to electro-physiology, electro-therapy and radiography. The physiological apparatus will be exhibited in the Physiological Institute, and will be in charge of Prof. Kronecker, director of the Institute, to whom communications relating to it should be addressed. The induction coils, contact-breakers, vacuum tubes and other apparatus connected with the production and uses of Röntgen rays in medicine will be in charge of Herr O. Pasche, chief of the Röntgen Institute of the Bern

Hospital. The exhibition will be opened on August 29, and intending exhibitors should communicate as soon as possible with Herr Pasche, Röntgen Institute am Inselspital, Bern.

AT the present time, when much attention is being given to the reform of mathematical teaching associated with the name of Prof. Perry, the pamphlet entitled "The Cultivation of the Mathematical Imagination," by Miss Mary Everest Boole (Colchester: Benham and Co., price 6*d*.), appears very opportunely. The methods advocated by the authoress belong chiefly to the kindergarten stage of education, but there are many suggestions that are appropriate to a slightly more advanced stage; the central idea is always that of leading up to general truths by means of concrete processes. The pamphlet should be very helpful to teachers who wish to find out how to prepare the minds of young children to receive formal mathematical instruction.

PROF. R. W. WOOD writes:—"It may perhaps be a matter of some interest to teachers whose laboratory facilities are limited to know that solid carbon dioxide can be obtained from the sparklets now sold everywhere for a penny or two for the aëration of beverages. The larger of the two sizes gives the best yield, of course. It is best to cool the sparklet in ice and salt for a few minutes before the experiment, and doubtless the amount of solid obtained would be still further increased by chilling the metal reservoir with which the bottles are fitted. A small square of black velvet should be held, or tied with a turn or two of string, over the end of the tube which delivers the gas into the fluid. The nap of the cloth should be on the inside, and the part over the tube should form a little bag about the size of a marble. On discharging the sparklet and quickly removing the bag, the interior will be found to be lined with the snow-white solid, with which a small drop of mercury can be easily frozen. The substance shows off most beautifully on the jet black surface of the velvet."

THE death is announced of Mr. William Henry Penning. After pursuing a course of engineering under Mr. C. H. Gregory, he joined the staff of the Geological Survey in 1867 and was engaged in mapping portions of Essex, Suffolk, Cambridgshire and Lincolnshire. He was joint author of memoirs on the geology of the neighbourhood of Cambridge, Lincoln, and parts of Essex. He was author also of "A Text-Book of Field Geology," 1876 (edit. 2, 1879), and of "Engineering Geology," 1880. In 1882, through ill-health, he resigned his post on the Geological Survey and spent some time in South Africa. He died on April 20. We have also to regret the death of Mr. Joseph Nolan, who joined the Geological Survey in Ireland under Jukes in 1867, and after many years of active service in the field became in 1890 resident geologist in the Dublin office. He was author or part author of several memoirs in explanation of the Geological Survey maps. He retired from the public service in 1901 and died on April 19.

A STRONG earthquake was felt round Lake Baikal on April 12. It began at Irkutsk by a severe shock at 6h. 40m. a.m., the pendulum of the observatory being deflected by 22 mm. About twenty fairly severe shocks followed during the first minute. Groups of shocks next occurred, the strongest of them being at 7h. 13m., 7h. 31m., 7h. 36m. and 8h. 14m. All these shocks could be felt even without instruments, their force attaining the value of 5 in the seismic scale. The earthquake was widely felt round Lake Baikal. At Selenghinsk the chief disturbance travelled in a direction from S.W. to N.E. and the following shocks were noticed:—at 7h. 0m., 7h. 50m., 7h. 54m. and 8h. 35m. At the village Snyezhnaya, on the eastern coast of the lake, several chimneys were destroyed and crockery was thrown down. Further east, at Verkhneudinsk, and on the western coast, the shock was much feebler. During the night of April 10-11 a very strong earthquake was felt in the north of Finland. At Uleaborg window panes rattled and crockery fell from its place. Shocks of earthquake continue also to be felt at Shemakha. Two severe shocks were noticed on April 17 at 10h. 0m. and 10h. 30m. p.m.

IT seems at first sight to be a bold statement to put forward that the study of the distribution of plants may be dated back to the time of Alexander the Great. But no more weighty opinion could be obtained than that of a scholar who has combined the study of classics and botany. Herr Hugo Bretzl, as a thesis for his doctorate in Strassburg, has made a careful study of Theophrast's "Plant-geography," and comes to the conclusion that from the description there given of the air-roots of *Ficus bengalensis* the writer must have been able to refer to the original accounts of Alexander's expedition. The brochure received gives two chapters from the whole work, which is to be published in book form and promises to be exceedingly interesting. Not only does the author show that the Greeks realised such facts as the absence of the pine in all the countries which intervene between Macedonia and India, but incidentally his references suggest that the Aristotelan writers have not received due justice at the hands of other writers of historical botany.

IT will be remembered that in a recent issue notes of the discovery of a blood parasite occurring in man and belonging to the genus Trypanosoma were recorded. The case was one of a European, whose chief symptoms were irregular rises of temperture with afebrile intervals, the attack being accompanied by increased frequency of respiration and pulse. The parasite was present only during the febrile attacks, and whilst it closely resembled *T. Brucei* in form and staining reactions, it was, however, considerably smaller and in fixed specimens assumed a characteristic "set." Another striking feature, which reminds one of the diseases known as Nagana and Surra in horses and cattle, is the occurrence of œdema of the eyelids and feet. Nepveu claims to have discovered this parasite in man in Algiers, but his description is very imperfect and raises considerable doubts as to whether what he saw were really trypanosomes. Mr. J. Everett Dutton, who described the parasite occurring in the blood of a European at Bathurst, West Africa, has within the last few days added the most interesting observation that the parasite occurs also in native children. Whilst examining for malaria parasites a large number of microscopical blood preparations of the native children of a small village, a few miles nearer the mouth of the River Gambia than Bathurst, he found in one preparation a number of trypanosomes resembling in every way those found in the case of the European before recorded. This second observation opens up a large field for further investigation and points to the extreme importance of the study of the diseases of natives, especially from a parasitological point of view, in West Africa and other parts of the world.

THE Meteorological Office Pilot Chart for May gives a short account of submarine earthquakes and the curious sensations they produce on board ship. Within the basin of the North Atlantic the fairly well-defined seismic regions are near the equator, between 19° and 33° W.; about the West Indies; from the Cape Verde Islands north-westward to about 33° N., 41° W.; and from 34° to 45° N., 13° to 30° W. The ice season this spring is very late, no bergs having been reported down to April 16. The St. Lawrence River was open for navigation at Quebec on April 3, an unusually early date. Numerous observations show that during the month of February last the temperature of the surface water of the Atlantic was below the average over a space extending south-westward from the British

Isles as far as 30° W. longitude. On shore the month was the coldest we had experienced for seven years, the air temperature being from 3° to 5° under the normal for various localities.

THE Meteorological Council has issued a valuable paper entitled "Temperature Tables of the British Islands." The work is divided into two parts: (1) The results derived from thirty years' hourly observations (1871-1900) for the four observatories Valencia, Aberdeen, Falmouth and Kew, showing the means and extremes of temperature for each day of the year and for the month; (2) the means and extremes for each month and for the year for 117 stations, with records of not less than fifteen years. In order to give an adequate representation of monthly temperatures of the London area, a table for Greenwich is included, with the consent of the Astronomer Royal, which gives data for sixty years. In the diagrams representing the seasonal variations at the observatories, the curves for maximum and minimum readings are printed on tracing paper, so that they can be superposed one upon the other, or upon the curve showing the mean values. A special feature, it is stated, in the treatment of the seasonal curves is an attempt to define a normal seasonal variation of temperature by the harmonic analysis of five-day means, to which daily averages and individual observations can be referred.

THE first number of the third volume of the *West Indian Bulletin* is devoted to a summary of the business transacted during the Agricultural Conference at Barbados in January last; to full reports of a number of papers on various phases of the sugar industry, with short accounts of the discussions on them; and to two communications of a general character—"The Organisation and Functions of Boards of Agriculture" and a "Report of the Chemical Section at the Conference." With the approval of the Secretary of State it is proposed by the Commissioner shortly to commence the publication of a new fortnightly review, to be called the *Agricultural News*, intended to contain in popular form agricultural information suited to the circumstances of the West Indies.

A PAPER by Mr Horace C. Richards, on the harmonic curves known as Lissajou's figures, is not the least interesting feature of the *Journal* of the Franklin Institute for April. The diagrams traced by the aid of a harmonograph are remarkably perfect and beautiful.

AN illustrated account of M. Santos Dumont's Parisian experiments is now given in *Prometheus*, No. 642. It includes reproductions of photographs showing the results of the accidents on August 8 and September 6, 1901; the successful ascents of October last are illustrated by views of the balloon when starting and when rounding the Eiffel Tower and a chart of the course.

THE *Rendiconti* of the Lombardy Academy notes that the Bologna Medical and Surgical Society offers a prize of 500 lire for an essay on sero-diagnosis in tuberculosis. Further, the "Olympic Academy" of Vicenza offers a prize of 3160 lire for a study of the Italians living on the South American continent, including more particularly the question of emigration and the relation between the colonists and their mother country.

THE Deutsche Mathematiker-Vereinigung has decided on a new departure in regard to the publication of its *Jahresbericht*. Under the editorship of Prof. A. Gutzmer, of Jena, this publication will in future appear monthly instead of annually, and among other features it is proposed to include academic dissertations, inaugural addresses, obituary notices both of members and of non-members, discussions on questions of teaching, notices of such undertakings as catalogues of current literature or the publication of Gauss's works, accounts of the meetings of societies, and notes and queries.

WE have received the April number of *Le mois scientifique*, which is devoted to a summary of recent books and publications on horticulture and botany. Among these we notice two new books on the cultivated plants of the south of France, one by M. Sauvaigo dealing with the Mediterranean coast, the other on southern flowers generally by M. Granger, and a new flora of France by M. A. Acloque.

UNDER the title of *Théorie nouvelle de la Loupe*, M. G. Quesneville has published, in Paris, a small *brochure* dealing with the optical properties of lenses, considered with especial reference to vision. The principal difference between the present and the conventional treatment is that here account is taken of what happens to the rays of light, not only during their passage through the system of lenses considered, but also after they enter the eye.

THE manufacture of butter with sterilised cream with the view of preventing the spread of tuberculosis is discussed by Drs. Serafino Belfanti and Costantino Coggi in the Lombardy *Rendiconti*, xxxv. 7. In Sweden and Denmark pasteurisation is already adopted on a large scale, but in Germany and Italy a prejudice still exists against butter made with cream that has been subjected to this precautionary measure. The paper shows that the process, so far from being detrimental to the quality of butter, may actually prove of commercial value, and that the problem of preventing the diffusion of tuberculosis by means of milk does not involve such great pecuniary sacrifices as have been sometimes anticipated.

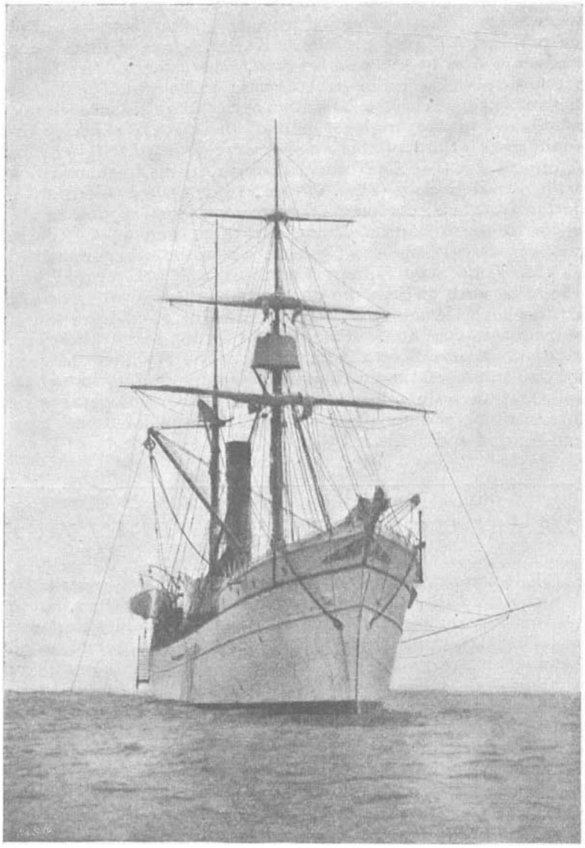
THE Geneva Society of Physics and Natural History has just issued the first part of volume xxxiv. of its *Mémoires*, containing reports of the work done during 1900 both in physical and biological science. Among the most interesting results we notice M. A. Brun's observation during the summer of 1900 of a peculiar kind of snow on Mont Malet, called "neige de Caucase," or Caucasian snow. It is a porous snow the grains of which attain a size of as much as three millimetres, and their want of adherence may readily give rise to avalanches. A new station at the Hospice of the Great St. Bernard is another feature noted in the *Mémoires*. The observations are made at the usual hours of the Swiss meteorological service, and the building is situated to the north-east of the old hospice. This departure is largely due to the energy of Prof. R. Gautier, who has equipped the station with thermometers and hygrometers specially adapted to high mountain work, and whose efforts have been ably supported by the monks.

WE have received a copy of an address on the teaching of biology delivered by Prof. Haberlandt on the occasion of the opening of the new scientific and medical institute at the University of Gratz on December 9, 1899.

FROM the Report of the Director for the year 1899-1900, it appears that so long ago as 1857 a Museum was established in the town of Trivandrum, Travancore, but that for many years its condition was far from flourishing. By the addition of a public garden and menagerie, affairs have been placed on a better footing; and it is satisfactory to learn that the museum is now devoted to the illustration of local zoology. The following sentence from the director's Report is somewhat remarkable:—"In 1890 I succeeded Colonel Ketchen as Honorary Secretary and received the honorarium usually given to the Honorary Secretaries."

IN vol. xxiv. (pp. 499-566) of the *Proceedings* of the U.S. Museum, Mr. W. H. Dall describes and figures a number of new or hitherto imperfectly known shells, mainly American, in the collection of which he has charge. A large number of these, belonging to Buccinum, Trophon and allied forms, are from Alaska and other parts of the Pacific coast of north-western America. Conspicuous among them is the handsome shell from Unalaska Island on which the genus and species *Beringius crebricostatus* were established by the author. A very large number of species belong to that group of Trophon which the author distinguishes as Boreotrophon.

THE numerous cruises of the U.S. Fish Commission steamer *Albatross* undertaken for the purposes of dredging, sounding and other objects connected with biology and hydrography are so important, and the literature relating to them is distributed through such a large number of serial and other publications, that all naturalists will be pleased to learn that a concise bibliography relative to the work of the vessel has been published. The task of compiling this record, which appears in the Report of the U.S. Fish Commission for 1900, has been entrusted to Mr. C. H. Townsend, the chief of the Fishery Division of the Commission, whose familiarity with the work of the ship, on board of which he served as naturalist from 1886 to 1900, rendered him peculiarly fitted for the task. The record comprises 172 closely printed pages, and is accompanied by a chart and illustrated with several views of the vessel, one of which is here reproduced. The first cruise took place in 1883, and the prime object of the work was the investigation of the fisheries and fishing-grounds. From 1892 to 1898 comparatively little work of this nature was, however, accomplished, owing to the vessel being employed on other services. For instance, at one time it was employed in Alaskan waters in connection with the Committee on Indian Affairs, on another occasion in laying the cable between California and Hawaii, and on a third occasion it was told off for service during the war with Spain. In spite of these withdrawals from its proper sphere, the vessel has made 1786 dredging and trawling hawls, at all depths down to 4173 fathoms, and extending over a very large area; while the soundings taken number at least 4000.



The U.S. steamer *Albatross* dredging, showing port boom rigged for surface towing.

MESSRS. WHITTAKER AND CO. announce that they will shortly publish in their specialist series a work entitled "Mechanical Refrigeration." The volume is by Mr. Hal Williams, and will deal with the whole field of ice-making and cold storage.

THE edition of the "Life of Charles Darwin," just published by Mr. John Murray at the modest price of half-a-crown, is a marvel of cheapness. The volume contains 348 pages, clearly printed on good paper and neatly bound; so that naturalists who do not possess a copy of the life of their master should hasten to add it to their libraries. A life like Darwin's inspires everyone with reverence for his greatness and the desire to walk humbly in the same light. The record and reminiscences of such a great career cannot be too widely read.

TO suggest subjects to study in outdoor nature, and facilitate the record of the observations, Miss W. L. Boys-Smith has prepared a "Nature Note-Book," which has been published by Messrs. Allman and Son. A few hints are given concerning obvious characteristics, dates of appearance and habits of some common animals and plants, and thirty-three questions set by the National Froebel Union to test observation are printed at the end of the book. The remaining pages are ruled for records of observation and remarks, and for drawings. In connection with the revival of nature study or natural history, the note-book should be of service to young students.

MR. JOHN MURRAY will publish almost immediately an important volume by Major Molesworth Sykes, entitled, "Ten Thousand Miles in Persia." During the eight years which Major Sykes spent in Persia, he travelled over and explored the country from the Caspian Sea to the Persian Gulf, and from the Tigris to the frontiers of Afghanistán and Baluchistán, his journeys extending to quite ten thousand miles. The book about to appear will contain a record of his travels, with special reference to the geography and history of the country as well as to its commercial resources, the opening up of trade routes and the journeys of Alexander the Great and Marco Polo.

NEW editions of two volumes in the comprehensive series of manuals of science and technology published by the house of Ulrico Hoepli, Milan, have recently been received. One is the third edition, revised and enlarged, of "Magnetismo e Elettricità," by Prof. F. Grassi. The book contains a good account of the principles of electricity and magnetism, and gives much more attention to the applications of these sciences than is usually the case in similar manuals. Another third edition is the "Manuale del Chimico e dell'Industrialè," by Prof. L. Gabba. This volume consists of a valuable collection of tables of standards, physical and chemical data, analytical processes, and similar information of service in laboratories and assay offices.

THE additions to the Zoological Society's Gardens during the past week include a Greater Sulphur-crested Cockàtoo (*Cacatua galerita*) from Australia, presented by Lady Stanley; a Scops Owl (*Scops giu*) European, presented by Miss G. Ashley Dodd; a Robben Island Snake (*Pseudaspis cana phocarum*) from South Africa, presented by Mr. T. E. Cartwright; an Antillean Boa (*Boa diviniloqua*) from the West Indies, presented by Mr. E. S. Graham; a Derbian Wallaby (*Macropus derbianus*), three Long-necked Chelodines (*Chelodina longicollis*), two Limbless Lizards (*Pygopus lepidopus*) from

Australia, twenty-one Giant Toads (*Bufo marinus*) from South America, three Spiny-tailed Iguanas (*Ctenosaura acanthura*) from Central America, a Dark Salamander (*Amblystoma tenebrosum*) from California, two Long-tailed Weaver-birds (*Chera progne*) from South Africa, a Starred Tortoise (*Testudo elegans*), three Bungoma River Turtle (*Emyda granosa*), a Ring-necked Parrakeet (*Palaeornis torquatus*) from India, deposited; two Nylghaies (*Boselaphus tragocamelus*, ♂ ♀), four Yellow-billed Liothrix (*Liothrix luteus*) from India, a Grison (*Galictis vittata*), a Condor Vulture (*Sarcorhamphus gryphus*, ♂), four Grey Teal (*Querquedula versicolor*, ♂ ♂ ♀ ♀) from South America, two Mantchurian Crossoptilons (*Crossoptilon mantchuricum*, ♂ ♀), a Bar-tailed Pheasant (*Phasianus reevesi*) from China, a Common Crowned Pigeon (*Goura coronata*) from New Guinea, two White-fronted Geese (*Anser albifrons*), four Bearded Tits (*Panurus biarmicus*), a Waxwing (*Ampelis garrulus*) European, purchased; five Indian Wild Swine (*Sus cristatus*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SIGNALS FROM MARS.—In the *Proceedings* of the American Philosophical Society for December 1901 (vol. xl. No. 167), Mr. Percival Lowell refers at some length to the observations that led to the announcement in the Press that Mars had been signalling to the earth on a night in December 1900. It may be mentioned that the *original* despatch read as follows:—"Projection observed last night over Icarium Mare, lasting seventy minutes." (Signed) "Douglas." In the present paper Mr. Lowell describes in detail some of the individual observations, and points out how the Flagstaff observations of 1894 showed that on general principles the Martian projections were most probably not due to the existence of mountain peaks. A close study of the surface markings led both Messrs. Lowell and Douglas to the result that these several projections were not caused by such permanent surface markings as mountains, but were the effect of clouds floating in the planet's atmosphere. At the opposition of 1894 more than 400 projections were seen in the course of nine months, and since that time other observations have helped to show that the non-reappearances of these projections at such favourable times when, if they were mountains, they should have been seen, have proved their non-permanent character. In fact, permanences like mountains were found to do violence to the observations, and the alternative explanation chosen was something floating in the planet's atmosphere and capable of reflecting light, or, in other words, clouds. Mr. Lowell, in his concluding remarks, says that the surface marking, Icarium Mare, is undoubtedly a great tract of vegetation, and the observation of December is completely explained if it be assumed that a cloud was formed over this region and rose to a height of thirteen miles, and then, travelling east by north at about twenty-seven miles an hour, passed over the desert of Aeria and there was dissipated after an existence of three or four days. The Flagstaff observations thus tell us that mountains on Mars, if there be any, have still to be discovered.

THE ORION NEBULA AND MOVEMENT IN THE LINE OF SIGHT.—Prof. H. C. Vogel communicates to the *Sitzungsberichte der Kön. Preuss. Akad. der Wissenschaften zu Berlin*, March 13, an account of the results which he and Dr. Eberhard have obtained with reference to the measurements of the spectrum of the Orion nebula taken for the determination of motion in the line of sight. The instruments used were the photographic refractor of 32·5 cm. aperture and 3·4 metres focal length, and a spectroscope with three prisms, the latter being supplied with electrical heating for maintaining a constant temperature during the time of exposure; the comparison spectrum was that of iron in every case. The measurements of all the photographs were made by Prof. Vogel and Dr. Eberhard independently of each other, and the region of the nebula investigated was practically the same as that examined by Prof. Keeler in 1890 and 1891, so that a direct comparison with his results can be made. The following table shows the values of the velocities in kilometres per second relative to the sun obtained from measurements at different parts of the Hγ line.

	Vogel. Km.	Eberhard. Km.
Position angle 90° from star θ' Orionis $\Delta = 0'\cdot8$; beginning of Hγ line ...	+16 ...	+17
At θ'	+16 ...	+16
Position angle 270°; $\Delta = 0'\cdot6$ most intense portion of Hγ line	+12 ...	+11
Position angle 270°; $\Delta = 1'\cdot2$ to $1'\cdot4$ near end of Hγ line...	+8 ...	+12

The mean velocity relative to the sun obtained by Keeler, who used the Hβ line, was + 17·7 ± 1·28 kilometres, a value not very much removed from the above-mentioned determination.

Another interesting point obtained from a close examination of the Hγ line was the distinct irregularity or hump of this line in the nebula spectrum, and both Prof. Vogel's and Dr. Eberhard's measures give velocities relative to the sun of + 6, + 28, + 11 and + 6, + 41, + 28 respectively to three chosen points on this line. It is pointed out that the measurements were difficult, and on account of the faintness of the line probably not very accurate. Keeler, however, looked for relative motion in the nebula itself, and came to the result that from his observations there were shifts which indicated relative motion in the nebula amounting to 21 kilometres per second, and in the brightest part of the nebula shifts corresponding to a third of this amount were detected. It may be mentioned also that Sir Norman Lockyer, in his communication to the Royal Society (*Phil. Trans.*, 1895) on the spectrum of the Orion nebula, obtained evidence of internal motion in the nebula in the distortion of the lines 4471 and 4495. These lines were found to be sharply bent, whilst the others remained straight. Unfortunately, only one photograph was secured, and it was suggested that in the absence of others it was possible that this displacement might have been due to a distortion of the photographic film. There seems little doubt, therefore, that these deformations and anomalies of the Hγ lines observed at Potsdam are real indications of relative motion in the nebula itself, and the values for the velocities given will perhaps be more accurately determined when further photographs have been secured and measured.

THE RELATIONS BETWEEN METALLURGY AND ENGINEERING.[1]

THE lecturer stated that this was the subject with which the council had requested him to deal in his lecture, but it must not for a moment be imagined that the metallurgic art was not included in the wide range covered by the Institution, which had, from its earliest days, given prominence to the work of metallurgists. He quoted Mr. G. P. Bidder, who, in his presidential address to the Institution delivered in 1860, said "that if he were called upon to define the object and scope of the profession of civil engineer, he would say that it was 'to take up the results discovered by the abstract men of science and to apply them practically for the commercial advantage of the world at large, and to diffuse their beneficent influence among all classes of his fellow citizens.'" He hoped to be able to show that metallurgists practising an industrial art had helped the engineer to do this, and in evidence that such was the case, he quoted from the presidential address of Sir John Fowler, words to the effect that engineers had been more assisted by members of the Institution and by distinguished men of science generally in relation to iron and steel than as regarded any other material. It was in connection with iron and steel that the illustrations of the lecture would be mainly given. It might at first be thought that the relations between metallurgists and engineers, which had become so close and enduring, arose quite simply from common interest. The case was, however, far from being so simple; communication between those who extracted metals from their ores and adapted them for the use of the engineers, who actually employed metals in construction, was seldom, at the outset, quite direct. The relations with which the lecture dealt had been strangely stimulated by the intervention of men who, in many cases, were neither engineers nor metallurgists, but were men whose lives had been devoted to

---

[1] Abstract of the tenth "James Forrest" Lecture, delivered by Sir W. C. Roberts-Austen, K.C.B., F.R.S., at the Institution of Civil Engineers on April 22.